

Application No. 10/579,798

Supplemental Response to Office Action dated April 3, 2009

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended): A low-carbon resulfurized free machining steel product, comprising, on the percent by mass basis, C: 0.02% to 0.12%, Si: 0.01% or less, Mn: 1.0% to 2.0%, P: 0.05% to 0.20%, S: 0.35% to 0.60%, N: 0.007% to 0.03%, with the balance being Fe and inevitable impurities, the contents of Mn and S satisfying the following conditions: $0.40 < \text{Mn} * \text{S} < 1.2$ ~~$0.50 < \text{Mn} * \text{S} < 0.8$~~ and $\text{Mn}/\text{S} \geq 3.0$, and the steel product having a ferrite-pearlite structure, wherein the average width (μm) of sulfide inclusions in the steel product is $2.8 * (\log d)$ or more, wherein d is the diameter (mm) of the steel product, and pro-eutectoid ferrite in the metallographic structure has a hardness HV of 133 to 150.

2. (Currently Amended): A low-carbon resulfurized free machining steel product comprising, on the percent by mass basis, C: 0.02% to 0.12%, Si: 0.01% or less, Mn: 1.0% to 2.0%, P: 0.05% to 0.20%, S: 0.35% to 0.60%, N: 0.007% to 0.03%, with the balance being Fe and inevitable impurities, the contents of Mn and S satisfying the following conditions $0.40 < \text{Mn} * \text{S} < 1.2$ ~~$0.50 < \text{Mn} * \text{S} < 0.8$~~ and $\text{Mn}/\text{S} \geq 3.0$, and the steel product having a ferrite-pearlite structure, wherein the average width (μm) of sulfide inclusions in the steel product is $2.8 * (\log d)$ or more, wherein d is the diameter (mm) of the steel product, and a difference in deformation resistance at a strain of 0.3 between 200°C and 25°C is 110 MPa or more and 200 MPa or less, the deformation resistances being determined at a deformation rate of 0.3 mm/min in a

Application No. 10/579,798

Supplemental Response to Office Action dated April 3, 2009

compression test.

3. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 1, wherein the steel product further comprises 70 ppm or more of dissolved nitrogen.

4. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 1, wherein the machining steel product comprises a Cr content of not more than 0.04%, and wherein the total content of Ti, Nb, V, Al and Zr is not more than 0.020%.

5. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 1, further comprising one or both of Cu: more than 0.30% and equal to or less than 1.0% and Ni: more than 0.20% and equal to or less than 1.0%.

6. (Previously Presented): A method for producing a low-carbon resulfurized free machining steel product, comprising casting a steel having the composition as defined in claim 1, and controlling, before the casting, free oxygen (Of) to a content of 30 ppm or more and less than 100 ppm and the ratio Of/S to within a range from 0.005 to 0.030, Of and S being contained in molten steel before casting.

7. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 2, wherein the steel product further comprises 70 ppm or more of dissolved

Application No. 10/579,798

Supplemental Response to Office Action dated April 3, 2009

nitrogen.

8. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 2, wherein the machining steel product comprises a Cr content of not more than 0.04%, and wherein the total content of Ti, Nb, V, Al and Zr is not more than 0.020%.

9. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 3, wherein the machining steel product comprises a Cr content of not more than 0.04%, and wherein the total content of Ti, Nb, V, Al and Zr is not more than 0.020%.

10. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 2, further comprising one or both of Cu: more than 0.30% and equal to or less than 1.0% and Ni: more than 0.20% and equal to or less than 1.0%.

11. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 3, further comprising one or both of Cu: more than 0.30% and equal to or less than 1.0% and Ni: more than 0.20% and equal to or less than 1.0%.

12. (Previously Presented): The low-carbon resulfurized free machining steel product according to claim 4, further comprising one or both of Cu: more than 0.30% and equal to or less than 1.0% and Ni: more than 0.20% and equal to or less than 1.0%.

Application No. 10/579,798

Supplemental Response to Office Action dated April 3, 2009

13. (Previously Presented): A method for producing a low-carbon resulfurized free machining steel product, comprising casting a steel having the composition as defined in claim 2, and controlling, before the casting, free oxygen (Of) to a content of 30 ppm or more and less than 100 ppm and the ratio Of/S to within a range from 0.005 to 0.030, Of and S being contained in molten steel before casting.

14. (Previously Presented): A method for producing a low-carbon resulfurized free machining steel product, comprising casting a steel having the composition as defined in claim 3, and controlling, before the casting, free oxygen (Of) to a content of 30 ppm or more and less than 100 ppm and the ratio Of/S to within a range from 0.005 to 0.030, Of and S being contained in molten steel before casting.

15. (Previously Presented): A method for producing a low-carbon resulfurized free machining steel product, comprising casting a steel having the composition as defined in claim 4, and controlling, before the casting, free oxygen (Of) to a content of 30 ppm or more and less than 100 ppm and the ratio Of/S to within a range from 0.005 to 0.030, Of and S being contained in molten steel before casting.

16. (Previously Presented): A method for producing a low-carbon resulfurized free machining steel product, comprising casting a steel having the composition as defined in claim 5, and controlling, before the casting, free oxygen (Of) to a content of 30 ppm or more and less than 100 ppm and the ratio Of/S to within a range from 0.005 to 0.030, Of and S being

Application No. 10/579,798

Supplemental Response to Office Action dated April 3, 2009

contained in molten steel before casting.

17. (Previously Presented): The steel product of claim 1, in the form of a nipple.
18. (Previously Presented): The steel product of claim 1, in the form of a screw.
19. (Previously Presented): The steel product of claim 1, in the form of a wire rod.
20. (Previously Presented): The steel product of claim 1, in the form of a steel bar.